

AMENDMENTS TO THE CLAIMS

Claims 1, 18, 35 and 52 are amended herein. All pending claims are produced below.

1. (Currently Amended) A method of encoding video images, where each image has a frame type, the method executed by a computer and comprising:
 - receiving a plurality of macroblocks for an uncompressed image;
 - determining a macroblock type for each macroblock;
 - determining whether the image represents a scene change based upon a distribution of macroblock types of the macroblocks and the frame type of the image,
wherein the scene change is determined as a function of a percentage of prediction macroblocks in the image;
 - encoding the image without changing the frame type of the image in response to the determination of a scene change and the frame type of the image; and
 - outputting the encoded image.
2. (Canceled)
3. (Original) The method of claim 1, wherein determining whether the image represents a scene change, comprises:
 - responsive to the image being a forward predicted frame type, determining a percentage of intra-encoded macroblocks; and
 - responsive to the percentage of intra-encoded macroblocks, identifying a scene change at the image.
4. (Original) The method of claim 3, further comprising:
 - responsive to the percentage of intra-encoded macroblocks exceeding a threshold, identifying a scene change at the image.
5. (Original) The method of claim 4, wherein the threshold is about .65.

6. (Original) The method of claim 1, wherein determining whether the image represents a scene change, comprises:

responsive to the image being a bidirectionally predicted frame type, determining a percentage of backward predicted macroblocks; and
responsive to the percentage of backward predicted macroblocks, identifying a scene change at the image.

7. (Original) The method of claim 6, further comprising:

responsive to the percentage of backward predicted macroblocks exceeding a threshold, identifying a scene change at the image.

8. (Original) The method of claim 7, wherein the threshold is about .70.

9. (Original) The method of claim 1, wherein determining whether the image represents a scene change, comprises:

responsive to the image being a bidirectionally predicted frame type, determining a percentage of forward predicted macroblocks; and
responsive to the percentage of forward predicted macroblocks, identifying a scene change at the image.

10. (Original) The method of claim 6, further comprising:

responsive to the percentage of forward predicted macroblocks exceeding a threshold, identifying a scene change at the image.

11. (Original) The method of claim 7, wherein the threshold is about .70.

12. (Original) The method of claim 1, wherein determining whether the image represents a scene change, comprises:

responsive to the image being a forward predicted frame type, determining a percentage of intra-encoded macroblocks;
responsive to the image being a bidirectionally predicted frame type, determining a percentage of backward predicted macroblocks;

responsive to the image being a bidirectionally predicted frame type, determining a percentage of forward predicted macroblocks; and
responsive to a determined percentage exceeding a threshold corresponding to the type of macroblock, identifying the image as a scene change.

13. (Original) The method of claim 1, wherein encoding the image in response to the determination of a scene change and the type of the frame comprises increasing a number of bits used to encode the image, without changing the frame type of the image.

14. (Original) The method of claim 1, wherein encoding the image in response to the determination of a scene change and the type of the frame comprises changing a quantization rate used to quantize the image, without changing the frame type of the image.

15. (Original) The method of claim 1, wherein encoding the image in response to the determination of a scene change and the type of the frame comprises temporarily increasing a counter of a number of bits available for encoding a remaining set of images in a group of images containing the uncompressed image.

16. (Original) The method of claim 1, wherein encoding the image in response to the determination of a scene change and the type of the frame comprises temporarily increasing a counter of a number of bits allocated to images having a same frame type as the frame type of the uncompressed image, in a group of images including the uncompressed image.

17. (Original) The method of claim 1, further comprising:

responsive to determining a scene change, generating data identifying the uncompressed image as corresponding to a scene change, and storing the generated data in a side information file for transmission or storage.

18. (Currently Amended) A computer system for encoding video images, comprising:

a processor;
a memory;

a motion estimator adapted to receive from the memory a plurality of macroblocks for an uncompressed video image, the image having a frame type, and to determine macroblocks types for the macroblocks;

a scene change detector coupled to the motion estimator and adapted to determine whether the image represents a scene change based upon a distribution of the macroblock types of the image macroblocks and the frame type of the image, wherein the scene detector determines whether the image represents a scene change as a function of a percentage of prediction macroblocks in the image;

and

a quantizer coupled to the scene change detector for encoding the image without changing the frame type of the image in response to the determination of a scene change by the scene change detector and the frame type of the image, and for storing the encoded image in the memory;

wherein the motion estimator, scene change detector, and the quantizer are executed by the processor.

19. (Canceled)

20. (Original) The system of claim 18, wherein the scene change detector determines whether the image represents a scene change by determining a percentage of intra-encoded macroblocks in response to the image being a forward predicted frame type.

21. (Original) The system of claim 20, wherein the scene change detector determines the scene change in response to the percentage of intra-encoded macroblocks exceeding a threshold.

22. (Original) The system of claim 21, wherein the threshold is about .65.

23. (Original) The system of claim 18, wherein the scene change detector determines whether the image represents a scene change by determining a percentage of backward predicted macroblocks in response to the image being a bidirectionally predicted frame type.

24. (Original) The system of claim 23, wherein the scene change detector determines the scene change in response to the percentage of backward predicted macroblocks exceeding a threshold.

25. (Original) The system of claim 24, wherein the threshold is about .70.

26. (Original) The system of claim 18, wherein the scene change detector determines whether the image represents a scene change by determining a percentage of forward predicted macroblocks in response to the image being a bidirectionally predicted frame type.

27. (Original) The system of claim 26, wherein the scene change detector determines the scene change in response to the percentage of forward predicted macroblocks exceeding a threshold.

28. (Original) The system of claim 27, wherein the threshold is about .70.

29. (Original) The system of claim 18, wherein the scene change detector determines whether the image represents a scene change by:

- determining a percentage of intra-encoded macroblocks in response to the image being a forward predicted frame type;
- determining a percentage of backward predicted macroblocks in response to the image being a bidirectionally predicted frame type;
- determining a percentage of forward predicted macroblocks in response to the image being a bidirectionally predicted frame type; and
- responsive to a determined percentage exceeding a threshold corresponding to the type of macroblock, identifying the image as a scene change.

30. (Original) The system of claim 18, wherein the quantizer encodes the image in response to the determination of a scene change and the type of the frame by increasing a number of bits used to encode the image, without changing the frame type of the image.

31. (Original) The system of claim 18, wherein the quantizer encodes the image in response to the determination of a scene change and the type of the frame by changing a quantization rate used to quantize the image, without changing the frame type of the image.

32. (Original) The system of claim 18, wherein the quantizer encodes the image in response to the determination of a scene change and the type of the frame by temporarily increasing a counter of a number of bits available for encoding a remaining set of images in a group of images containing the uncompressed image.

33. (Original) The system of claim 18, wherein the quantizer encodes the image in response to the determination of a scene change and the type of the frame by temporarily increasing a counter of a number of bits allocated to images having a same frame type as the frame type of the uncompressed image, in a group of images including the uncompressed image.

34. (Original) The system of claim 18, wherein the scene change detector is further adapted, responsive to determining a scene change, to generate data identifying the uncompressed image as corresponding to a scene change, and storing the generated data in a side information file for transmission or storage.

35. (Currently Amended) A computer program product, adapted to encode video images, comprising a computer readable storage medium containing computer executable instructions executable by a processor to control the processor of a computer system for performing the operations of:

reading from a memory of the computer system an uncompressed image including a plurality of macroblocks;

determining a macroblock type for each of the plurality of macroblocks in the uncompressed image;

determining whether the image represents a scene change based upon a distribution of macroblock types of the macroblocks and the frame type of the image, wherein the scene change is determined as a function of a percentage of prediction macroblocks in the image;

encoding the image without changing the frame type of the image in response to the determination of a scene change and the frame type of the image; and storing the encoded image in the memory of the computer system.

36. (Canceled)

37. (Original) The computer program product of claim 35, wherein determining whether the image represents a scene change, comprises:

responsive to the image being a forward predicted frame type, determining a percentage of intra-encoded macroblocks; and responsive to the percentage of intra-encoded macroblocks, identifying a scene change at the image.

38. (Original) The computer program product of claim 37, further comprising:

responsive to the percentage of intra-encoded macroblocks exceeding a threshold, identifying a scene change at the image.

39. (Original) The computer program product of claim 38, wherein the threshold is about .65.

40. (Original) The computer program product of claim 35, wherein determining whether the image represents a scene change, comprises:

responsive to the image being a bidirectionally predicted frame type, determining a percentage of backward predicted macroblocks; and responsive to the percentage of backward predicted macroblocks, identifying a scene change at the image.

41. (Original) The computer program product of claim 40, further comprising:

responsive to the percentage of backward predicted macroblocks exceeding a threshold, identifying a scene change at the image.

42. (Original) The computer program product of claim 41, wherein the threshold is about .70.

43. (Original) The computer program product of claim 35, wherein determining whether the image represents a scene change, comprises:

responsive to the image being a bidirectionally predicted frame type, determining a percentage of forward predicted macroblocks; and
responsive to the percentage of forward predicted macroblocks, identifying a scene change at the image.

44. (Original) The computer program product of claim 43, further comprising:

responsive to the percentage of forward predicted macroblocks exceeding a threshold, identifying a scene change at the image.

45. (Original) The computer program product of claim 44, wherein the threshold is about .70.

46. (Original) The computer program product of claim 35, wherein determining whether the image represents a scene change, comprises:

responsive to the image being a forward predicted frame type, determining a percentage of intra-encoded macroblocks;
responsive to the image being a bidirectionally predicted frame type, determining a percentage of backward predicted macroblocks;
responsive to the image being a bidirectionally predicted frame type, determining a percentage of forward predicted macroblocks; and
responsive to the determined percentage exceeding a threshold corresponding to the type of macroblock, identifying the image as a scene change.

47. (Original) The computer program product of claim 35, wherein encoding the image in response to the determination of a scene change and the type of the frame comprises

increasing a number of bits used to encode the image, without changing the frame type of the image.

48. (Original) The computer program product of claim 35, wherein encoding the image in response to the determination of a scene change and the type of the frame comprises changing a quantization rate used to quantize the image, without changing the frame type of the image.

49. (Original) The computer program product of claim 35, wherein encoding the image in response to the determination of a scene change and the type of the frame comprises temporarily increasing a counter of a number of bits available for encoding a remaining set of images in a group of images containing the uncompressed image.

50. (Original) The computer program product of claim 35, wherein encoding the image in response to the determination of a scene change and the type of the frame comprises temporarily increasing a counter of a number of bits allocated to images having a same frame type as the frame type of the uncompressed image, in a group of images including the uncompressed image.

51. (Original) The computer program product of claim 35, further comprising:
responsive to determining a scene change, generating data identifying the
uncompressed image as corresponding to a scene change, and storing the
generated data in a side information file for transmission or storage.

52. (Currently Amended) A computer system for encoding video images, each image having a frame type, comprising:

a processor;

a memory;

motion estimation means for receiving from the memory a plurality of macroblocks
for an uncompressed video image and determining a macroblock type for each
macroblock;

scene change detection means for determine whether the image represents a scene change based upon a distribution of macroblock types of the image macroblocks and the frame type of the image, wherein the scene change is determined as a function of a percentage of prediction macroblocks in the image; and

encoding means for encoding the image without changing the frame type of the image in response to the determination of a scene change by the scene change detection means and the frame type of the image, and for storing the encoded image in the memory;

wherein the motion estimation means, scene change detection means, and the encoding means are executed by the processor.

53. (Original) The system of claim 52, wherein the scene change detection means determines whether the image represents a scene change by:

determining a percentage of intra-encoded macroblocks in response to the image being a forward predicted frame type;

determining a percentage of backward predicted macroblocks in response to the image being a bidirectionally predicted frame type;

determining a percentage of forward predicted macroblocks in response to the image being a bidirectionally predicted frame type; and

responsive to a determined percentage exceeding a threshold corresponding to the type of macroblock, identifying the image as a scene change.

54. (Original) The system of claim 52, wherein the encoding means encodes the image in response to the determination of a scene change and the type of the frame by increasing a number of bits used to encode the image, without changing the frame type of the image.

55. (Original) The system of claim 52, wherein the encoding means encodes the image in response to the determination of a scene change and the type of the frame by changing a quantization rate used to quantize the image, without changing the frame type of the image.

56. (Original) The system of claim 52, wherein the encoding means encodes the image in response to the determination of a scene change and the type of the frame by temporarily increasing a counter of a number of bits available for encoding a remaining set of images in a group of images containing the uncompressed image.

57. (Original) The system of claim 52, wherein the encoding means encodes the image in response to the determination of a scene change and the type of the frame by temporarily increasing a counter of a number of bits allocated to images having a same frame type as the frame type of the uncompressed image, in a group of images including the uncompressed image.

58. (Original) The system of claim 52, wherein the scene change detection means is further adapted, responsive to determining a scene change, to generate data identifying the uncompressed image as corresponding to a scene change, and storing the generated data in a side information file for transmission or storage.

59. (New) A method of encoding video images, where each image has a frame type, the method executed by a computer and comprising:

- receiving a plurality of macroblocks for an uncompressed image;
- determining a macroblock type for each macroblock;
- determining whether the image represents a scene change based upon a distribution of macroblock types of the macroblocks and the frame type of the image;
- encoding the image without changing the frame type of the image in response to the determination of a scene change and the frame type of the image, wherein the encoding changes a quantization rate used to quantize the image, without changing the frame type of the image; and
- outputting the encoded image.

60. (New) A method of encoding video images, where each image has a frame type, the method executed by a computer and comprising:

- receiving a plurality of macroblocks for an uncompressed image;
- determining a macroblock type for each macroblock;

determining whether the image represents a scene change based upon a distribution of macroblock types of the macroblocks and the frame type of the image;
encoding the image without changing the frame type of the image in response to the determination of a scene change and the frame type of the image, wherein the encoding temporarily increases a counter of a number of bits available for encoding a remaining set of images in a group of images containing the uncompressed image; and
outputting the encoded image.

61. (New) A method of encoding video images, where each image has a frame type, the method executed by a computer and comprising:

receiving a plurality of macroblocks for an uncompressed image;
determining a macroblock type for each macroblock;
determining whether the image represents a scene change based upon a distribution of macroblock types of the macroblocks and the frame type of the image;
encoding the image without changing the frame type of the image in response to the determination of a scene change and the frame type of the image, wherein the encoding temporarily increases a counter of a number of bits allocated to images having a same frame type as the frame type of the uncompressed image, in a group of images including the uncompressed image; and
outputting the encoded image.

62. (New) A computer program product, adapted to encode video images, comprising a computer readable storage medium containing computer executable instructions executable by a processor to control the processor of a computer system for performing the operations of:

receiving a plurality of macroblocks for an uncompressed image;
determining a macroblock type for each macroblock;
determining whether the image represents a scene change based upon a distribution of macroblock types of the macroblocks and the frame type of the image;
encoding the image without changing the frame type of the image in response to the determination of a scene change and the frame type of the image, wherein the

encoding changes a quantization rate used to quantize the image, without changing the frame type of the image; and
outputting the encoded image.

63. (New) A computer program product, adapted to encode video images, comprising a computer readable storage medium containing computer executable instructions executable by a processor to control the processor of a computer system for performing the operations of:

receiving a plurality of macroblocks for an uncompressed image;
determining a macroblock type for each macroblock;
determining whether the image represents a scene change based upon a distribution of macroblock types of the macroblocks and the frame type of the image;
encoding the image without changing the frame type of the image in response to the determination of a scene change and the frame type of the image, wherein the encoding temporarily increases a counter of a number of bits available for encoding a remaining set of images in a group of images containing the uncompressed image; and
outputting the encoded image.

64. (New) A computer program product, adapted to encode video images, comprising a computer readable storage medium containing computer executable instructions executable by a processor to control the processor of a computer system for performing the operations of:

receiving a plurality of macroblocks for an uncompressed image;
determining a macroblock type for each macroblock;
determining whether the image represents a scene change based upon a distribution of macroblock types of the macroblocks and the frame type of the image;
encoding the image without changing the frame type of the image in response to the determination of a scene change and the frame type of the image, wherein the encoding temporarily increases a counter of a number of bits allocated to images having a same frame type as the frame type of the uncompressed image, in a group of images including the uncompressed image; and
outputting the encoded image.